High-Altitude Fast-Response CO_2 Analyzer (WB-57 version)

Instrument: High-Altitude Fast-Response CO_2 Analyzer
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Measurement Description: Similar to the ER-2 instrument, the high-altitude fast response CO_2 instrument used on the WB-57 measures CO_2 concentrations in situ using the light source, gas cells, and solid-state detector from a modified nondispersive infrared CO_2 analyzer (Li-Cor, Inc., Lincoln, NE). These components are stabilized along the detection axis, vibrationally isolated, and housed in a temperature-controlled pressure vessel. Sample air enters a rear-facing inlet, is preconditioned using a Nafion drier (to remove water vapor), then is compressed by a Teflon diaphragm pump. A second water trap, using dry ice, reduces the sample air dewpoint to less than –70C prior to detection. The CO_2 mixing ratio of air flowing through the sample gas cell is determined by measuring absorption at 4.26 microns relative to a reference gas of known concentration. In-flight calibrations are performed by replacing the air sample with reference gas every 10 minutes, with a low-span and a high-span gas every 20 minutes, and with a long-term primary standard every 2 hours. The long-term standard is used sparingly and serves as a check of the flight-to-flight accuracy and precision of the measurements, augmented by ground-based calibrations before and after flights.

Accuracy: ±0.1 ppm
Precision: ±0.1 ppm
Weight: 125 lbs.
Power: 225W typical, 500W maximum
Response Time: 2 seconds
Location on WB-57: On pallet, with Harvard Total Water instrument